

1 – Lake County Exceptional Events Detail

Parameter: PM_{2.5}

Dates: May 24 & 30, 2007

Location: Gary / E. Chicago / Griffith / Hammond - Lake Co.

Event: Smoke from wildfires in northern Florida and southern Georgia impacted the Lake County region on May 24 and 30. The buildup of smoke moving through the area during this period resulted in an exceedance of the 24-hour PM_{2.5} NAAQS on May 30 at Gary – Burr St. (18-089-0026) and several elevated readings throughout Lake County on both days.

Data: Different analyses of the data are used to demonstrate that the PM_{2.5} concentrations measured on May 24 and 30 have been influenced by outside events. Table 1.1 shows daily PM_{2.5} averages prior to, during, and after the event with the values flagged in **bold**. Data have been flagged with an exceptional event flag of 'E' in AQS, awaiting concurrence from EPA.

Tables 1.2 and 1.3 list summaries of the data collected at the Lake County sites since 2000. Summary data from 2007 and the annual and daily design values for 2005-2007 are calculated with all current data and with the flagged data removed.

There is only one change in the Daily Design Values at the sites with the flagged data removed. This occurred at Gary – Burr St. All currently operating sites will remain either slightly below or above the daily NAAQS. All sites which are compared to the annual NAAQS, had design values less than the NAAQS value prior to flagging. When the flagged data were excluded, the design values improve. These improved values may be the difference between nonattainment and attainment of the annual NAAQS when the design values are calculated for 2006-2008 and for 2007-2009.

**Table 1.1 - FRM Daily Values
Exceptional Event Period**

Values in **BOLD** are flagged as exceptional events

Date	East Chicago 18-089-006	Gary - IITRI 18-089-0022	Gary - Burr St 18-089-0026	Griffith 18-089-0027	Gary Water 18-089-0028	Gary Ivanhoe 18-089-1003	Hammond Purdue 18-089-2004	Hammond Robertsdale 18-089-2010
5/18/07	14.6	12.6	13.6	9.4	12.5	13.9	9.6	11.9
5/19/07								
5/20/07								
5/21/07	14.3	12.7	19	13.6	14.2	16	14.2	14.1
5/22/07								
5/23/07								
5/24/07	29.5	28.4	31.2	27.6	27.6	30.4	30.1	29.3
5/25/07								
5/26/07								
5/27/07	8	8.8	9.4			9.4		8.3
5/28/07								
5/29/07								
5/30/07	32.5	31.9	36.8	30.9	31.6	33.1	32.4	32.2
5/31/07								
6/1/07								
6/2/07	11	11.1	12	10.2	10.7	11.1	10.5	11.9

Table 1.2 - Historical Daily Values

		Gary IITRI 18089022		Gary Water 180890028		Gary - Burr St. 18089026		Gary Ivanhoe 180891003	
Year		98th %ile	Daily Design Value ¹	98th %ile	Daily Design Value ¹	98th %ile	Daily Design Value ¹	98th %ile	Daily Design Value ¹
2000		43.6				33.8		33.1	
2001		48.7				42		37	
2002	2000- 2002	39.5	44			38.7	38	32.7	34
2003	2001- 2003	45.9	45			41.7	41	31	34
2004	2002- 2004	45.8	44			38.6	40	30.5	31
2005	2003- 2005	40.4	44	38.7	39	43.7	41	39	34
2006	2004- 2006	28.5	38	27.1	33	30.4	38	25.8	32
2007	2005- 2007	35.2	35	36.2	34	36.8	37	33.8	33
		Values excluding flagged data							
2007	2005- 2007	35.2	35	36.2	34	35	36	33.8	33

¹ Daily Design Value = 3 year average of annual 98th %ile values.

Table 1.2 (con't) - Historical Daily Values

		E. Chicago 180890006		Griffith 180890027		Hammond - Purdue 180892004		Hammond - Robertsdale 180892010	
Year		98th %ile	Daily Design Value ¹	98th %ile	Daily Design Value ¹	98th %ile	Daily Design Value ¹	98th %ile	Daily Design Value ¹
2000		34.2		31.9		32.8		33.9	
2001		39.8		37.3		36		37.9	
2002	2000- 2002	37.4	37	31.6	34	33.9	34	36.2	36
2003	2001- 2003	33.1	37	35.6	35	32.3	34	37.6	37
2004	2002- 2004	33	35	30.1	32	31.9	33	28.4	34
2005	2003- 2005	39.9	35	37.1	34	37.6	34	40.9	36
2006	2004- 2006	29.4	34	25.8	31	26.2	32	27.9	32
2007	2005- 2007	37.2	36	34.1	32	34.9	33	35.2	35
Values excluding flagged data									
2007	2005- 2007	37.2	36	34.1	32	34.9	33	35.2	35

¹Daily Design Value = 3 year average of annual 98th %ile values.

Table 1.3 - Historical Annual Averages

		Gary - IITRI 18089022		Gary Water 180890028		Gary - Burr St. 18089026		Gary Ivanhoe 180891003	
Year		Annual Ave.	Annual Design Value ²	Annual Ave.	Annual Design Value ²	Annual Ave.	Annual Design Value ²	Annual Ave.	Annual Design Value ²
2000		17.4				17.2		15.3	
2001		18				18.2		15	
2002	2000- 2002	16.4	17.3			17.7	17.7	15.2	15.2
2003	2001- 2003	16.6	17			17.4	17.7	14.1	14.8
2004	2002- 2004	16.1	16.4			16.5	17.2	12.9	14.1
2005	2003- 2005	18.3	17	16.6	16.6	18.7	17.5	15.7	14.3
2006	2004- 2006	13.6	16	13.3	15	14.7	16.7	12.6	13.7
2007	2005- 2007	15.1	15.6	14.6	14.8	16.1	16.5	14	14.1
Values excluding flagged data									
2007	2005- 2007	14.7	15.5	14.3	14.7	15.7	16.4	13.7	14

²Annual Design value = 3 year average of the annual averages.

Table 1.3 (con't) - Historical Annual Averages

		E. Chicago 180890006		Griffith 180890027		Hammond - Purdue 180892004		Hammond - Robertsdale 180892010	
Year		Annual Ave.	Annual Design Value ²	Annual Ave.	Annual Design Value ²	Annual Ave.	Annual Design Value ²	Annual Ave.	Annual Design Value ²
2000		15.8		14		15		14.3	
2001		16.1		15.2		15.4		15.5	
2002	2000- 2002	14.9	15.6	15.6	14.6	14.7	15	14.9	14.9
2003	2001- 2003	14.6	15.2	14.1	14.6	14.6	14.9	14.3	14.9
2004	2002- 2004	13.2	14.2	12.8	13.8	13.3	14.2	12.5	13.9
2005	2003- 2005	15.8	14.5	15.5	14.1	15.4	14.4	15.6	14.1
2006	2004- 2006	13.2	14	12.3	13.5	12.7	13.8	12.8	13.6
2007	2005- 2007	14.4	14.5	13.2	13.6	13.8	14	13.7	14
		Values excluding flagged data							
2007	2005- 2007	14.1	14.4	12.6	13.4	13.5	13.8	13.3	13.9

²Annual Design value = 3 year average of the annual averages.

Particulate

Composition: Speciation data are collected at the Gary – IITRI and Hammond - Purdue site on a one in six day sampling schedule. Data are available for May 24 and May 30. High organic carbon values were reported on those two dates; 9.35 ug/m³ and 8.17 ug/m³ at Gary and 9.86 ug/m³ and 8.07 ug/m³ at Hammond, respectively. These values were the highest values of the year at these two sites. The annual average for organic carbon is 3.45 ug/m³ at Gary and 3.23 ug/m³ at Hammond. The elemental carbon values were very near the annual average concentrations. The high organic carbon values, without an increase in elemental carbon, are a very good indicator of biomass combustion.

The maps in Appendix 3 indicate that the regional organic carbon values were elevated on the two available sample days. The time progression of the maps shows the rise and fall of the organic carbon values over this time period.

Maps:

Images of maps from NOAA Satellite and Information Services show the smoke plume originating from the northern Florida/southern Georgia region. Dispersion and movement of the smoke plume from these fires was generally to the west or northwest and then to the north. The daily satellite smoke photos show that the smoke plume from the fires extends into Lake County on May 24. The plume recedes farther to the south and east and

returns to influence the May 30 sample. The daily wind roses (obtained from the nearest meteorological site at Gary - IITRI, 18-089-0022) show information on prevailing wind direction, calm conditions and wind speed. NOAA weather maps are also used to show that an upper level trough greatly influences the direction of the plume in relation to the Lake County region.

Trajectory
Modeling:

The NOAA HYSPLIT Models are used to show wind trajectories at different levels during this event. Backward modeling from the site (latitude: 41.60°; longitude: -87.34°) at elevations of 25m, 150m and 500m was conducted for a period of three (3) to four (4) days prior. The differing elevations were chosen to demonstrate the air mass's uniformity at ground-level where the samplers were located and aloft which avoids the ground-level limitations of the model. Forward modeling was conducted using the Bugaboo Scrub Fire as the starting point (latitude: 30.70°; longitude: -82.40°) at an elevation of 250 meters (appropriate height that is low enough to always be in the well-mixed zone and high enough to avoid the ground-level model limitation) and going three (3) to four (4) days. Overall, there is a very good correlation when comparing the forward and backward trajectories for a given date. May 24 and 30 show a very narrow channel of air flow between southeastern Georgia and Lake County. Forward trajectory modeling can be found in Appendix 2.

Conclusion:

EPA defines an “exceptional event” as an unusual or naturally occurring event that can affect air quality but is not reasonably controllable by state and local agencies. Exceptional events are events for which the normal planning and regulatory process established by the clean air act is not appropriate. It has been illustrated through the use of maps, meteorological data, speciation data, trajectory models and historical data that the smoke from wildfires in Florida and Georgia impacted the Lake County region on the days of May 24 and 30, 2007 causing elevated levels of the PM_{2.5} 24-hour standard and significantly increasing the annual average. According to 40 CFR Part 50.14 (b)(1), “EPA shall exclude data from use in determinations of exceedances and NAAQS violations where a State demonstrates to EPA’s satisfaction that an exceptional event caused a specific air pollution concentration in excess of one or more national ambient air quality standards at a particular air quality monitoring location and otherwise satisfies the requirements of this section.” IDEM believes they have successfully illustrated the impact of this event on the sites in this region.

Therefore, IDEM requests that EPA concur with the ‘E’ flag on the data in AQS for the data in **bold** in Table 1.1.

NOAA Satellite Smoke Maps, Weather Maps, and Wind Roses

The smoke map shows that the plume is remaining over the area. The prevailing wind direction has shifted to the south as the upper level trough moves further to the east and another trough develops over Ohio, keeping the plume over the Lake county region.

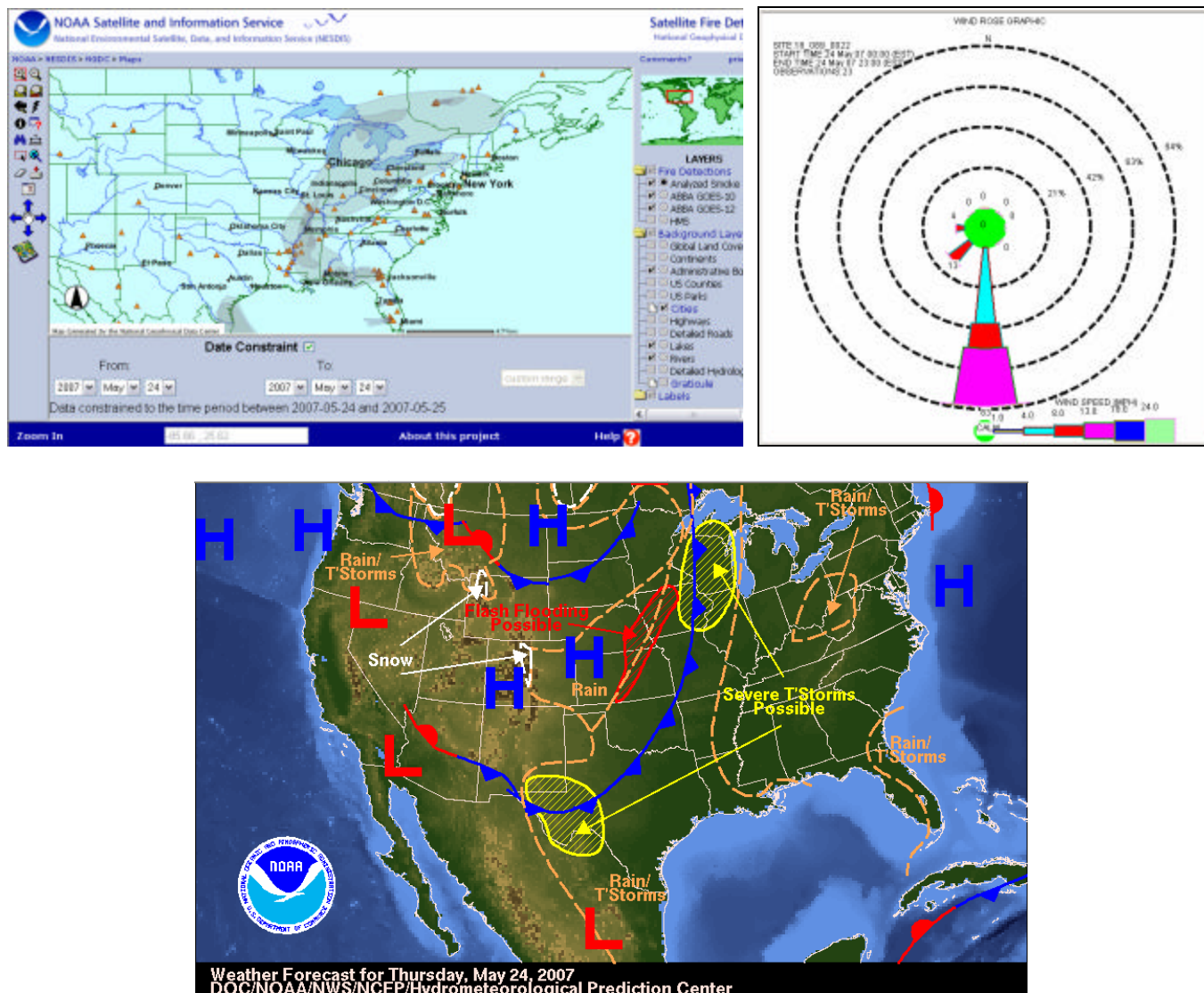


Figure 1.1 - May 24, 2007

The map shows the plume has moved back over the region as the upper level trough dips down over the area and the wind direction continues to be from the south.

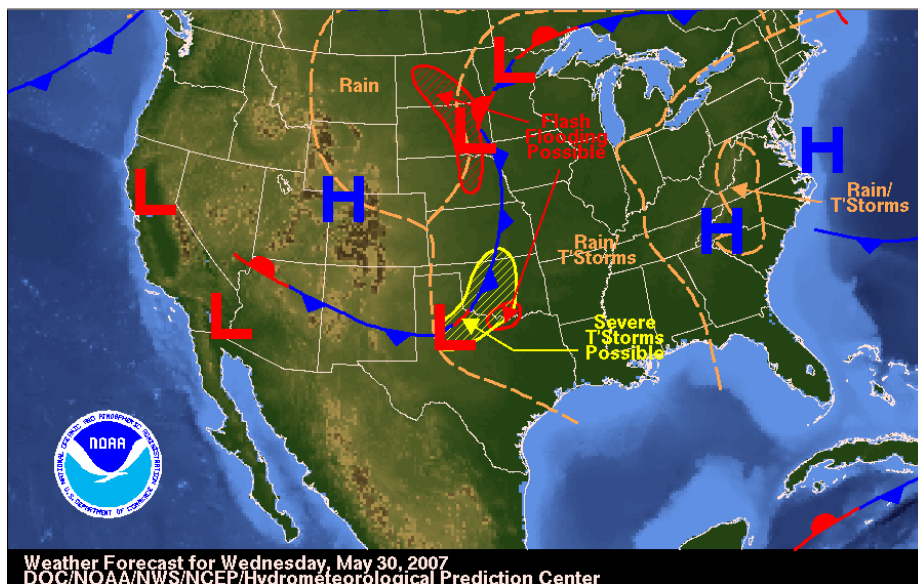
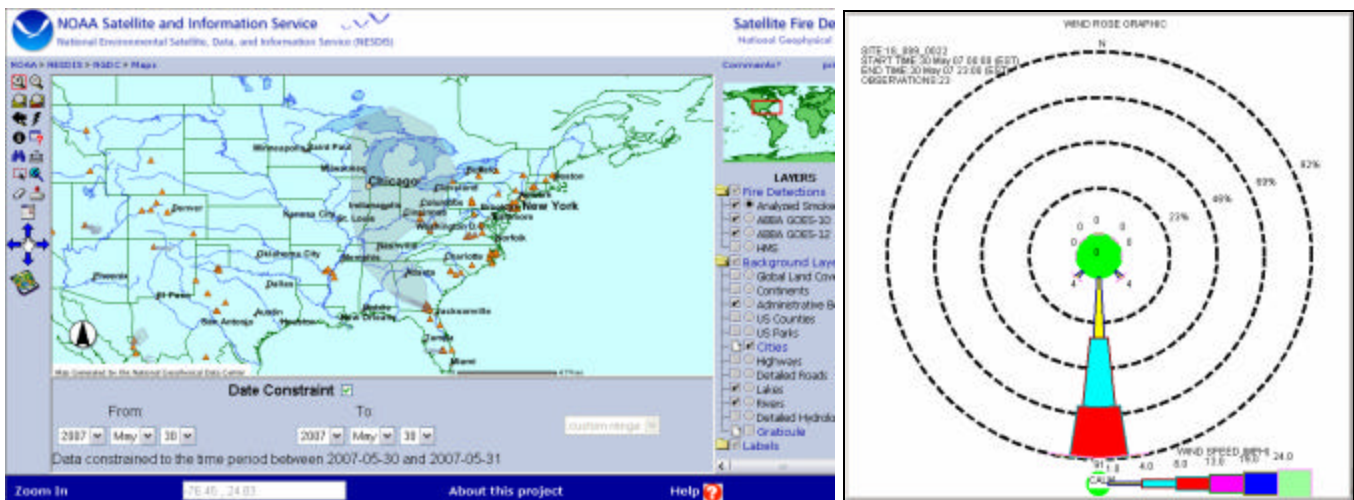


Figure 1.2 - May 30, 2007

Backward Trajectory Models

NOAA ARL READY HYSPLIT Maps

Draxler, R.R. and Rolph, G.D., 2003. HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) Model access via NOAA ARL READY Website (<http://www.arl.noaa.gov/ready/hysplit4.html>). NOAA Air Resources Laboratory, Silver Spring, MD.

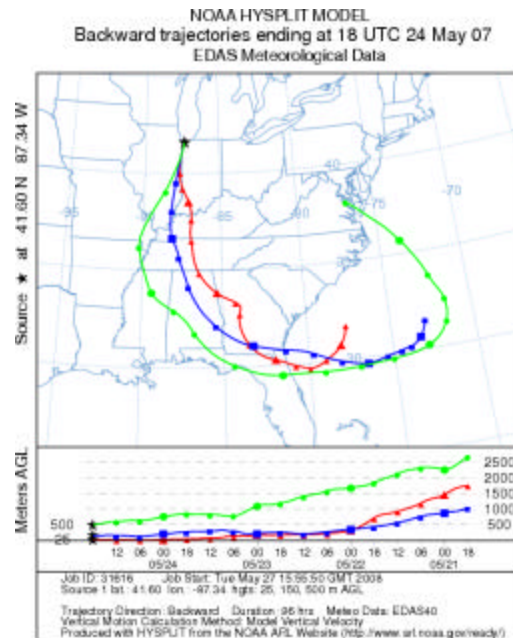


Figure 1.3: Backward trajectories originating from Gary on 5/24/07 at 12:00 PM CST showing consistency in the air mass passing over southern Georgia and northern Florida.

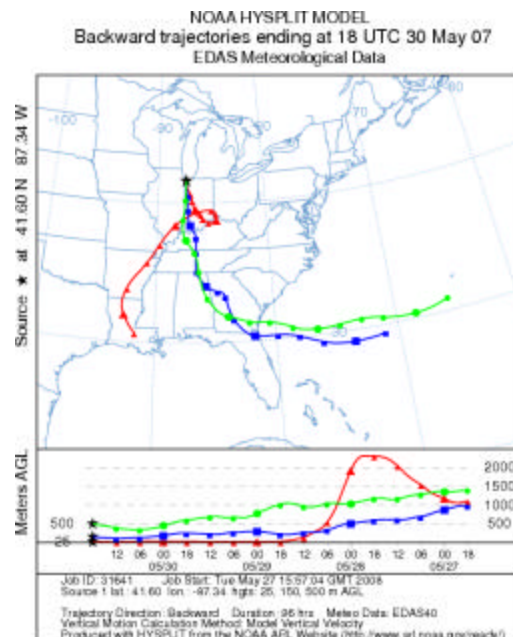


Figure 1.4: Backward trajectories originating from Gary on 5/30/07 at 12:00 PM CST showing continuation of the air mass passing over southern Georgia and northern Florida.